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10/823,347	04/12/2004	Soo Young Choi	APPM/8657/DISPLAY/AKT/RKK	4736

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EXAMINER	
CHANDRA, SATISH	
ART UNIT	PAPER NUMBER
1792	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/823,347	CHOI ET AL.	
	Examiner	Art Unit	
	SATISH CHANDRA	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 June 0208*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *23-48* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *23 - 48* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *01 April 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *8/04, 1/06, 3/08*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 23 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cain et al (US 5,439,524) in view of Chang et al (US 6,040,022), Hamelin et al (US 2006/0134919), Fukuda (US 2003/0097987).

Cain et al discloses:

Regarding claims 23 and 36, a plasma processing apparatus wherein an RF power source is coupled to the diffuser plate 42 (Fig 2). The distribution plate has an upstream side and a downstream side (not labeled) comprising a plurality of gas passages 50 between the upstream side and the downstream side.

Cain does not disclose:

Regarding claims 23 and 36, at least one gas passage is located in the center of the diffuser plate and hexagonal patterns of gas passages are disposed thereabout.

Chang et al discloses: an inlet gas manifold for a vacuum deposition chamber wherein the holes 31 (Fig 5) are arranged in a pattern of overlapping interlocking face

centered hexagons 41, FIG. 5. Each element 41 of the pattern comprises an array of six adjacent holes 31, the centers of which define the intersection points of the hexagon sides. Each individual face centered aperture 31 is the intersection point of seven hexagons including the surrounding hexagon and six additional peripheral hexagons. This interlocking face centered hexagon structure is believed to be the most highly dense aperture array available. That is, this array provides the highest number density of holes for a given manifold area.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a gas passage in the center of the diffuser plate and hexagonal patterns of gas passages disposed thereabout in the apparatus of Cain et al as taught by Chang et al. It would have obvious to a skilled artisan to combine prior art elements to yield predictable results such as providing a gas passage in the center of the diffuser plate and hexagonal patterns of gas passages disposed thereabout in the apparatus of Cain et al as taught by Chang et al.

The motivation for providing a gas passage in the center of the diffuser plate and hexagonal patterns of gas passages disposed thereabout in the apparatus of Cain et al is to optimize the gas flow distribution in the apparatus of Cain et al and Chang et al.

Cain et al and Chang et al do not disclose:

Regarding claims 23 and 36, at least one of the gas passages has a first cylindrical shape for a portion of its length extending from the upstream side, a second coaxial cylindrical shape with a smaller diameter connected to the first cylindrical shape and extending for a portion of its length, a coaxial conical shape connected to the

second cylindrical shape for the length of the remaining portion of the diffuser plate, with the upstream end of the conical shape having substantially the same diameter as the second cylindrical shape and the downstream end of the conical shape having a larger diameter.

Hamelin et al discloses:

Regarding claims 23 and 36, a distribution plate 430 (Fig 9B) comprising: a plurality of gas passages 446 passing between the upstream and downstream sides, wherein at least one of the gas passages has a first right cylindrical shape for a portion of its length extending from the upstream side, a second coaxial cylindrical shape with a smaller diameter connected to the first cylindrical shape, a coaxial conical shape 444 connected to the second cylindrical shape for the remaining length of the diffuser plate, with the upstream end of the conical portion having substantially the same diameter as the second cylindrical shape and the downstream end of the conical portion having a larger diameter.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide gas passages of Hamelin et al in the distribution plate in the apparatus of Cain et al and Chang et al. It would also have been obvious to a skilled artisan to combine prior art elements to yield predictable results such as providing the apertures of Hamelin et al in the distributor plate of Cain et al and Chang et al as taught by Hamelin et al.

The motivation for providing the gas passages of Hamelin et al in the distribution plate in the apparatus of Cain et al and Chang et al is to optimize the apparatus of Cain et al and Chang et al for uniform distribution of gas flow.

Cain et al, Chang et al and Hamelin et al do not disclose:

Regarding claim 36, plasma process chamber coupled to a remote plasma source and the remote plasma source is coupled to a fluorine source.

Fukuda discloses:

Regarding claim 36, a remote plasma cleaning method (Fig 1, Para 0011) in which a cleaning gas (NF3) is excited to a plasma state by microwaves and activated inside an external discharge chamber isolated from the reaction chamber.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a remote plasma generator coupled to a fluorine source and to the processing chamber in the apparatus of Cain et al, Chang et al and Hamelin et al as taught by Fukuda. It would have been obvious to a skilled artisan to combine prior art elements to yield predictable results such as providing a remote plasma generator coupled to a fluorine source and to the processing chamber in the apparatus of Cain et al, Chang et al and Hamelin et al as taught by Fukuda .

The motivation for providing a remote plasma generator coupled to a fluorine source and to the processing chamber in the apparatus of Cain et al, Chang et al and Hamelin et al is to provide fluorine radicals for cleaning the processing chamber of Cain and Hamelin et al as taught by Fukuda.

Claims 24 – 31, 33, 35, 37 - 44, 46 and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cain et al (US 5,439,524) in view of Chang et al (US 6,040,022), Hamelin et al (US 2006/0134919) and Fukuda (US 2003/0097987) as discussed in claims 23 and 36 above and further in view of Metzner et al (US6,454,860).

Cain et al, Chang et al, Hamelin et al and Fukuda do not disclose:

Regarding claims 24 and 37, the diameter of the portion having the first cylindrical shape is between about 0.06 inch to about 0.3 inch.

Regarding claims 25 and 38, the diameter of the portion having the second cylindrical shape is between about 0.030 inch to about 0.070 inch.

Regarding claims 27 and 40, the diameter of the downstream end of the conical portion having the conical shape between about 0.2 inch to about 0.4 inch.

Regarding claims 29 and 42, the ratio of the length of the portion having the second cylindrical shape to the length of the portion having the conical shape between about 0.8 to about 2.0.

Regarding claims 30 and 43, the spacing between the downstream end of the conical portion of adjacent gas passages is at most about 0.5 inch.

Regarding claims 31 and 44, the thickness of the diffuser plate is between about 1.0 inch to about 2.2 inches.

Metzner et al discloses:

Regarding claims 24 and 37, the diameter of the first cylindrical shape 247 is 0.11 inch (Fig 9, Col 11, line 6).

Regarding claims 25 and 38, the diameter of the second cylindrical shape 286 is 0.08 inch (Fig 9, Col 11, line 17).

Regarding claims 26 and 39, the ratio of the length of the first right cylindrical shape to the length of the second cylindrical shape is about 1.37 (ratio of 0.11 to 0.08).

Regarding claims 27 and 40, the diameter of the downstream end 288 of the conical portion is 0.213 inch (Column 11, line 55).

Regarding claims 29 and 42, the ratio of the length (0.028 inch) of the second cylindrical shape 286 (Fig 9) to the length 255 (0.1021 inch) of the conical shape is between 0.8 to about 2.0 (Columns 11 and 12).

Regarding claims 30 and 43, the spacing 261 (Fig 9) between the downstream end of the conical portion of adjacent gas passages is 0.005 inch (Column 13, lines 2-4).

Regarding claims 31 and 44, the thickness of the diffuser plate is 0.4 inch (Column 12, line 14).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the diameter of the first cylindrical shape about 0.11 inch, diameter of the second cylindrical shape of 0.08 inch, the diameter of the downstream end of the conical portion of 0.213 inch, the ratio of the length of the second cylindrical shape to the length of the conical shape between 0.8 to about 2.0, the spacing between the downstream end of the conical portion of the adjacent gas

passage of 0.005 inch and a diffuser plate of thickness 0.4 inch in the apparatus of Cain et al, Chang et al, Hamelin et al and Fukuda as taught by Metzner.

It would also have been obvious to one of ordinary skill in the art at the time the invention was made to provide a diffuser plate of appropriate thickness between about 1.0 inch to about 2.2 inches in the apparatus of Cain et al, Chang et al, Hamelin et al, Fukuda and Metzner et al.

The motivation for providing the diameter of the first cylindrical shape about 0.11 inch, diameter of the second cylindrical shape of 0.08 inch, the diameter of the downstream end of the conical portion of 0.213 inch, the ratio of the length of the second cylindrical shape to the length of the conical shape between 0.8 to about 2.0, the spacing between the downstream end of the conical portion of the adjacent gas passage of 0.005 inch and a diffuser plate of thickness 0.4 inch in the apparatus of Cain et al and Hamelin et al is to optimize the distribution plate of Cain et al, Chang et al and Hamelin et al for distributing a uniform gas flow in the processing chamber .

The motivation for providing a diffuser plate of thickness between about 1.0 inch to about 2.2 inches in the apparatus of Cain et al, Chang et al, Hamelin et al, Fukuda and Metzner et al is to provide a diffuser plate of desired thickness to withstand the harsh plasma atmosphere in the apparatus of Cain et al, Chang et al, Hamelin et al, Fukuda and Metzner et al. Further it has been held where the only difference between the prior art and the claims is a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device is not patentably distinct from the prior art

device. In Gardner v. TEC Systems, Inc., 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984).

Cain et al, Change et al, Hamelin et al, Fukuda and Metzner et al do not disclose:

Regarding claims 28 and 41, the conical shape is flared at about 20 degrees to about 35 degrees.

Regarding claims 33 and 46, the cylindrical shape formed through the diffuser plate have a flow restricting attribute different than the coaxial flared shape.

Regarding claims 35 and 48, the gas diffuser plate size is at least 1080 inch^2.

The angle, aperture length ratios and their diameters and size of the diffuser plate in a processing chamber are the obvious design limitations. One of ordinary skill in the art would be able to optimize the angle, aperture length ratios and aperture diameters. Furthermore, it was held where the only difference between the prior art and the claims is a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device is not patentably distinct from the prior art device. In Gardner v. TEC Systems, Inc., 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984) and It was also held in *re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966)* that the shape was a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular shape was significant. (Also see MPEP 2144.04(d)).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the angle, aperture length ratios, aperture diameters and the size of the distributor plate in the apparatus of Cain et al, Chang et al, Hamelin et al, Fukuda and Metzner et al.

It would also have been obvious to one of ordinary skill in the art at the time the invention was made to have a flow restricting attribute in the cylindrical hole different from the coaxial flared shape opening in the apparatus of Cain et al, Chang et al, Hamelin et al, Fukuda and Metzner et al.

The motivation for providing a flow restricting attribute in the cylindrical opening different from the coaxial flared shape opening because of having a smaller diameter of the cylindrical hole compared to the diameter in the flared opening in the apparatus of Cain et al, Chang et al, Hamelin et al, Fukuda and Metzner et al is to provide an optimal pressure difference across the distribution plate for uniform gas flow distribution.

Claims 32 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cain et al (US 5,439,524) in view of Chang et al (US 6,040,022), Hamelin et al (US 2006/0134919), Fukuda (US 2003/0097987) and Metzner et al (US 6,454,860) as discussed in claims 24 – 31, 33, 35, 37 - 44, 46 and 48 above and further in view of White et al (US 2003/0066607).

Cain et al, Chang et al, Hamelin et al, Fukuda and Metzner et al do not disclose:

Regarding claims 32, 34, 45 and 47, the diffuser plate is either polygonal or rectangular.

White et al discloses: a rectangular gas distribution plate 20 for distribution process gas in the chamber (Para 0040).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a rectangular distribution plate for distribution process gas in the chamber in the apparatus of Cain et al, chang et al, Hamelin et al, Fukuda and Metzner et al as taught by White et al.

It would also have been obvious to one of ordinary skill in the art at the time the invention was made to provide a polygonal distribution plate for distribution process gas in the chamber in the apparatus of Cain et al, Chang et al, Hamelin et al, Fukuda and Metzner et al.

The motivation for providing a rectangular distribution plate is provide a distribution plate of suitable geometry for gas distribution in the apparatus of Cain et al, Chang et al, Hamelin et al, Fukuda and Metzner et al as taught by White et al.

The motivation for providing a polygonal distribution plate is again to provide a distribution plate of suitable geometry for gas distribution in the apparatus of Cain et al, Chang et al, Hamelin et al, Fukuda and Metzner et al, which is an alternate and equivalent distribution plate. Furthermore It was held in *re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966)* that the shape was a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular shape was significant. (Also see MPEP 2144.04(d)).

Response to Arguments

Applicant's arguments with respect to claims 23 - 48 have been considered but are moot in view of the new ground(s) of rejection.

Due to claims amendment, a new reference of Chang et al has been brought in to reject claims 23 and 26. Chang et al discloses an inlet gas manifold for a vacuum deposition chamber wherein the holes 31 (Fig 5) are arranged in a pattern of overlapping interlocking face centered hexagons 41, FIG. 5. Each element 41 of the pattern comprises an array of six adjacent holes 31, the centers of which define the intersection points of the hexagon sides. Each individual face centered aperture 31 is the intersection point of seven hexagons including the surrounding hexagon and six additional peripheral hexagons.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SATISH CHANDRA whose telephone number is (571)272-3769. The examiner can normally be reached on 8 a.m. - 4:30 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jeffrie R. Lund/
Primary Examiner, Art Unit 1792

Satish Chandra

Jeffrie R. Lund

Primary Examiner

SC
7/9//2008